

# Physiotherapy assessment of patients with rotator cuff pathology

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## Abstract

Pathology of the rotator cuff and sub-acromial bursa are considered to be the main cause of shoulder pain and dysfunction. In the absence of trauma, conservative care, including physiotherapy is the primary treatment. This paper aims to present the key features of a physiotherapy assessment, excluding diagnostic tests for rotator cuff pathology. It describes and explores how assessment can be used to direct management options and develop a treatment plan.

## Keywords

Assessment, physiotherapy, shoulder pain, impingement, rotator cuff

## Introduction

Rotator cuff pathology refers to a spectrum of pathology including tendinopathy, tendinosis and bursitis, as well as rotator cuff tears. The key features distinguishing this group from other common shoulder pathologies are shown in Fig. 1. The reported age range is wide (35 years to 75 years), encompassing the younger sports person, as well as those in middle and older age where rotator cuff tears are more prevalent.<sup>1,2</sup> The predominant symptom for which patients seek help is pain with or without weakness; however, there is clearly a wide diversity of presentations within these subgroups.<sup>3</sup> Fundamentally, other than the presentation of an acute traumatic rotator cuff tear in 'a younger patient', which requires an urgent referral for scanning and surgical repair, the consensus is that initial management should be conservative.<sup>4,5</sup> It is only when primary care treatment fails to improve signs and symptoms that onward referral to intermediate and secondary care should be made. The present review essentially considers an assessment of atraumatic rotator cuff pathology and the factors that should be taken into account in conservative management.

Physiotherapy assessment is the normal precursor to all physiotherapy interactions and is commonly undertaken without previous imaging. In view of the acknowledged lack of correlation between symptoms and the structural integrity of the rotator cuff,<sup>6,7</sup> one

must question whether knowledge of its status has any benefit for conservative management.

Where there has been a clear history of trauma or a previous poor response to conservative measures, imaging is clearly an integral part of identifying management options. Nonetheless if, as the evidence suggests, a high proportion of patients with insidious onset shoulder pain benefit from conservative measure,<sup>8,9</sup> is it helpful to know the status of the rotator cuff unless they have failed treatment? Often in clinical practice once patients know there is a cuff tear, there is an understandable assumption that it should be repaired.

With increasing research publications and a plethora of literature that questions the reliability and validity of clinical tests,<sup>10,11</sup> a physiotherapist can feel overwhelmed with the possible options to follow and assess. The present review aims to present the key aspects of physiotherapy assessment from a clinical

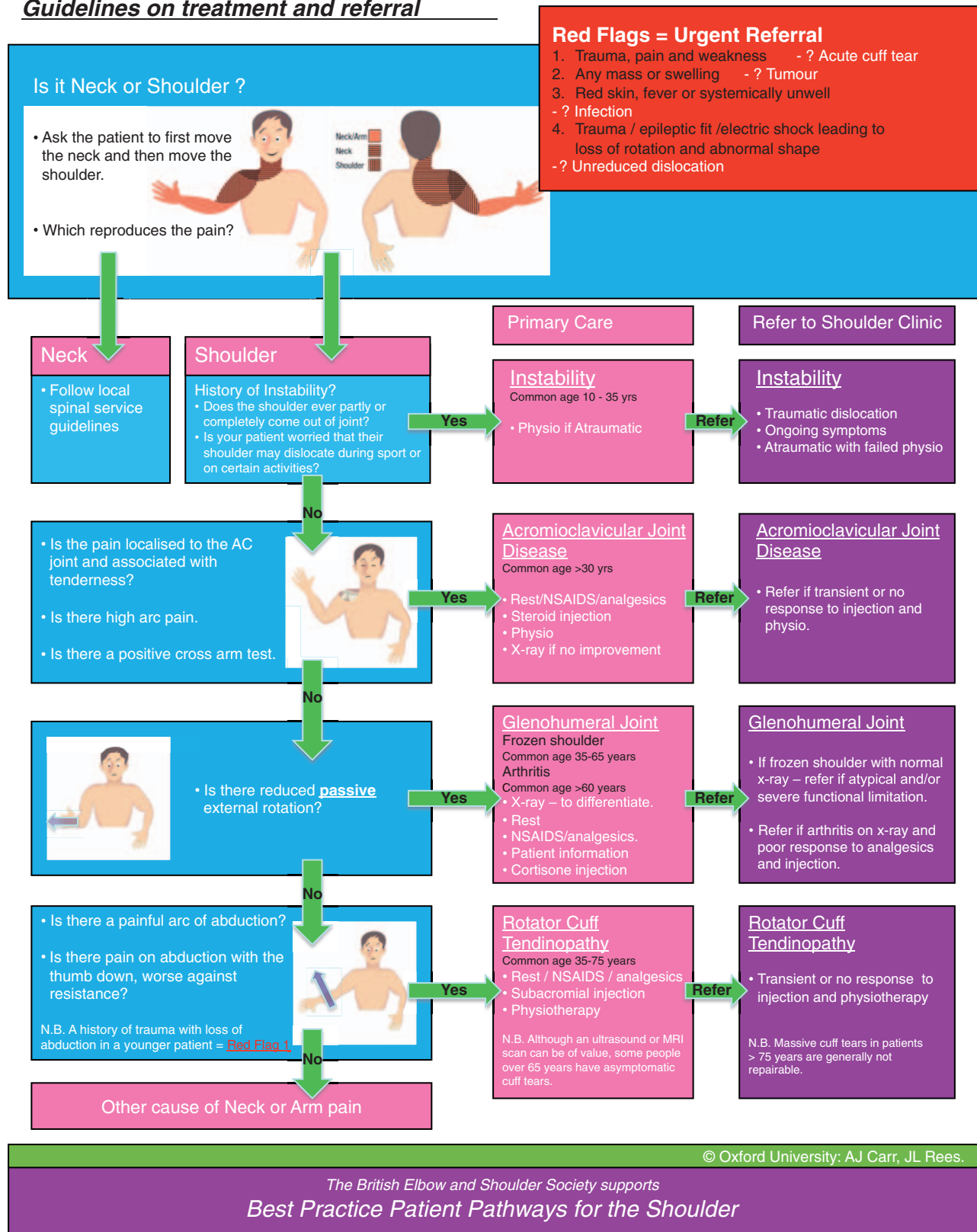
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## Diagnosis of Shoulder problems in Primary Care:

### Guidelines on treatment and referral



**Figure 1.** Algorithm.

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perspective, with clinical reasoning and evidence, where possible. Clinical tests for rotator cuff pathology are not examined in this paper. Physiotherapy treatment is formulated from the individual-specific assessment. Clinical reasoning can be based on three different types of reasoning: diagnostic, hypothetico-deductive and narrative, although all of these are heavily dependent on the individual's subjective history to direct the physical examination.<sup>12</sup>

### Physiotherapy assessment

In the UK, a new patient physiotherapy consultation varies from 20 minutes to 60 minutes. The current emphasis on providing evidence-based care with increasing efficiency can influence the timings of both assessments and the number of subsequent treatment sessions 'allowed'. Ideally, the initial assessment will include time to formulate an agreed treatment plan and a goal with approximate timescale.<sup>13</sup>

Assessment aims to answer four key questions:

- (i) What is the patient's main problem?
- (ii) What is the likely diagnosis/pathology and does that require immediate/early onward referral for scanning/surgery/second opinion?
- (iii) What are the patients functional demands – both at work and leisure?
- (iv) What can physiotherapy effect to enable the patient to achieve their goals (i.e. pain, strength, mobility, etc.).

Assessment is conventionally divided into subjective and objective components.

### Subjective history examination

There are key features clinicians seek to extrapolate during the subjective examination to enable effective clinical reasoning and goal setting.

#### *Age, arm dominance and arm function in daily life*

These factors set the context of management. Age helps to determine the likelihood of degenerative pathology, which may influence expected findings or realistic goal setting. An understanding of dominance and arm function is imperative in determining the contributory factors in symptom development. For example, is the arm involved in over activity, under activity or highly repetitive actions (e.g. swimming)? Has the patient started a 'new' activity, perhaps with weight or sustained straight-arm activities (e.g. wall papering, pruning in garden, etc.) that may have resulted in 'overload' of the upper quadrant?

### *Establishing the patient's main problem*

Is this predominantly pain, weakness, stiffness or fear of what it is? Night pain resulting in sleep disturbance is debilitating. Although night pain is commonly reported as a feature of rotator cuff tears as a stand alone symptom, it lacks specificity.<sup>14</sup> However, ongoing poor sleep interacts with depressive symptoms and increases pain perception.<sup>15</sup>

### *How is it affecting their function and life?*

Appreciating the impact of symptoms on an individual's function and life are paramount in treatment planning. The distress and anxiety related to an inability to work can provide potential barriers to treatment compliance.<sup>16</sup> Determining the expectations and beliefs of the patient is increasingly being shown to be an instrumental part of establishing the therapeutic relationship and influencing outcome.<sup>17,18</sup>

### *Nature of pain*

Pain is the most common symptom propelling patients to seek help. However, clinicians must have an awareness of the complexity of pain<sup>19</sup> and the contribution of the spine in shoulder pathologies.<sup>20,21</sup> The presence of central sensitization has been identified in patients with intact rotator cuff tendons undergoing subacromial decompression and is associated with poorer outcomes.<sup>19,22</sup> Table 1 summarizes the key characteristics considered when differentiating between local shoulder pathology and those of neurogenic origin.

### *History*

An acute onset of symptoms related to trauma should alert the clinician to the possibility of an acute cuff tear in 'younger' patients necessitating urgent onward referral for imaging and possible surgical repair. However, the definition of 'younger' is not clear<sup>4</sup> and represents another variable in surgical decision making.<sup>23</sup>

Others may describe an onset related to a definite event (e.g. awkward movement, lifting) with reports of feeling or hearing 'tearing' or 'something going' in the shoulder. Clinicians should consider whether this may represent an extension of an asymptomatic degenerative rotator cuff or biceps tear and explain a change in pain or functional ability? Many individuals cannot identify any trigger, and report an insidious onset with night or increasing pain intensity and the inability to use the arm, provoking the need for medical help. It is of note that high severity of symptoms and long duration at baseline are linked to a poor prognosis with physiotherapy intervention.<sup>24</sup>

**Table 1.** Pain characteristics in primary shoulder compared to neurogenic clinical presentations.

Pain	Shoulder/rotator cuff	Neural/shoulder
Nature	Toothache Related to activity	Burning Nervy/paraesthesiae Latent – pain comes later Random shooting pain in arm Ipsilateral carpal tunnel, lateral epicondylalgia
Where	Upper arm Radiating to elbow (commonly) Wrist (less often)	Scapula Shoulder/arm Coracoid Radiating whole arm – to hand
Easing	Arm below shoulder height Rest (but not at night) Definite (if temporary) response to subacromial local anaesthetic/corticosteroid injection	Resting arm on top of head. <sup>21</sup> Lying on shoulder Poor/no response or worsened response to subacromial local anaesthetic/corticosteroid injection
Aggravating	Lying on it Moving – abduction > flexion Sustained long arm activities Night pain Lifting	Often cannot say Sitting Being still Arm elevation Activities with hand behind back

### Previous treatment response

A response (or lack of) to previous treatments can be pertinent. A negative response to corticosteroid injection, especially if under ultrasound scan guidance, has been linked with poorer outcome with surgery<sup>25</sup> and can alert the physiotherapist to consider other pain sources or mechanisms. Similarly, a lack of response to previous physiotherapy may require exploration. Did therapy incorporate the key ingredients reported in successful interventions?<sup>8,26</sup> Did patients persevere with the exercise programme for an appropriate period (e.g. 6 weeks to 12 weeks)?<sup>8,9,26,27</sup>

By effectively exploring the patient's subjective history, the physiotherapist will generate a hypothesis that will be proved or modified during the physical examination.

### 'Objective' or physical examination

A structured approach to the objective examination enables a thorough consideration of potential contributory factors in rotator cuff pathology.

#### Observation

Simple observation of the head, neck and upper limb at rest in sitting or standing should consider muscle atrophy (indicative of chronicity), biceps rupture (?underlying massive rotator cuff tear) or obvious asymmetry between the symptomatic and nonsymptomatic sides. If

the patient complains of pain at rest and relative symmetry can be restored with correction of the upper quadrant position, the clinician can assess the effect of this. A worsening of symptoms would suggest that the asymmetry is an antalgic posture. However, an improvement in symptoms helps to both identify a potential treatment strategy and direct the subsequent examination.<sup>28,29</sup> Although no specific posture type has been linked with shoulder pain,<sup>30,31</sup> improving thoracic extension and scapula position with taping has been found to improve shoulder elevation range of movement and change the pain response in patients with subacromial pain.<sup>32</sup>

### Cervical and thoracic spine movements

The cervical and thoracic spine may need to be examined for stiffness or pain reproduction/alteration. This is particularly indicated in the presence of scapula pain, posterior shoulder pain and referral of symptoms below the elbow. If cervical spine movements reproduce pain and a 'sub-optimal' scapula resting position is improved with repositioning, the clinician can reassess whether the spinal movements continue to give shoulder pain? If they do, then the primary pain source is more likely to be spinal/neurogenic. If however, pain is abolished or reduced by scapula repositioning this directs assessment to the scapulothoracic area.

The scapula is the link between the cervical spine and shoulder complex, playing an important role in providing both mobility and stability.<sup>21</sup> Scapula dysfunction

has been found in patients with chronic mechanical neck pain,<sup>33,34</sup> with increased upper trapezius activity being linked to the severity of neck pain experienced.<sup>35</sup>

### Scapula movements

Examination of both active and passive scapula movements can reveal limited movements as a result of pain, tightness or fear of movement. If the scapula position can be manually 'corrected' and supported without pain generation, it may suggest an initial need to reduce loading (i.e. lying down or use of supportive taping). A patient with scapula pain and an elevated scapula may assume this posture because it is often protective for referred cervical spine pain. If this is the case, care should be taken not to provoke a significant neural pain response, which can be latent and difficult to settle. Watching the scapula moving independently can be useful, particularly in patients with higher level symptoms, and is simple in comparison to analyzing scapulo humeral rhythm.

**Scapulo Humeral Rhythm (SHR).** SHR can be summarized as follows: if full arm elevation achieves 180°, this is accomplished by the glenohumeral joint moving 120° and the scapula upwardly rotates 60°. In practice, there are three main phases to look for with arm elevation, as well as the descent movement.<sup>36–38</sup> Elevation can be observed through abduction, flexion and the scapula plane.

- (i) The initial 30° where the scapula is reported to be relatively stable
- (ii) Upward rotation of the scapula, where the inferior pole of the scapula is moving up and forwards towards mid-axillary line
- (iii) Nearer the end of range, some scapula elevation with posterior tilt (ie. inferior pole tucks into the chest)
- (iv) Controlled de-rotation on descent, with relatively symmetrical movement to the other shoulder

The term scapula dyskinesis is used when altered scapular position and motion is seen.<sup>29,39</sup> Commonly, it refers to scapula winging, tilting or dysrhythmia, where movement is not fluid or smooth but, instead, stuttering or juddering. Excessive protraction, where the inferior angle just glides anteriorly around chest wall (Fig. 2) or increased scapula elevation may also be seen. Movement faults are more likely to be seen through flexion<sup>39</sup> and the test can be weighted (3 kg to 5 kg) for higher-level function patients.<sup>38</sup> The consensus is that complex classification systems have poor inter-tester reliability and thus a 'yes/no' approach to SHR assessment is recommended: recording the presence

(obvious/subtle) or absence of asymmetry and such observed movement faults.<sup>38,39</sup> However, it should be noted the relevance of scapula dyskinesis is still in question:<sup>40</sup> it is seen in a multitude of shoulder disorders<sup>29</sup> and has similar prevalence in the asymptomatic population.<sup>39</sup> What is significant and does perhaps underpin the current trend for tests that improve symptoms, is that a change in scapula movement correlates with good treatment outcomes.<sup>29</sup>

### Painful arc: improvement tests

The classic signs of a painful arc and the discrepancy between active and passive range of movement are common in rotator cuff pathology. If a patient reports a typical painful arc during active movement, the clinician can explore the impact on symptoms of altering the position of components of the upper quadrant. In addition, clinicians can explore the impact of influencing muscle activation patterns.

**The scapula assistance test (SAT).** The SAT involves manually assisting the scapula into upward rotation<sup>41</sup> with the inclusion of posterior tilt<sup>33</sup> during arm elevation and determining the effect on pain or movement (Fig. 3). A positive response would implicate the scapulothoracic area and direct further assessment.



**Figure 2.** Excessive protraction of the scapulae.



**Changing humeral rotation.** When some patients elevate through abduction, they maintain the humerus in a position of internal rotation (thumb down). Symptoms of a painful arc can commonly be improved by asking the patient to elevate with the humerus in external rotation (thumb up). Biomechanically, this increases the subacromial space and reduces bursal pressure.<sup>42</sup> Clinically, an increased pain response with external rotation can implicate neural pain mechanisms.

**Changing loading.** Reducing load around the shoulder complex is important to fully assess the functional status of the rotator cuff. For example, does bending the elbow when the patient elevates (reducing the lever arm), improve movement and reduce pain? If patients are unable to elevate the arm when standing, are they able to achieve control when lying? Removing the load can reduce pain inhibition and determine the true functional status of the rotator cuff. In addition, it can provide a starting point for treatment interventions.

**Influencing muscle activation patterns.** Many patients will complain of worsening pain on the descent phase of elevation. The addition of resistance to this movement can be an effective strategy in pain reduction (Fig. 4). This is a simple technique, which the patient can replicate at home with the use of resistance banding

(suspended from the top of a door) or by using their other hand.

These ‘symptom improvement tests’ enable the effective identification of treatment strategies but, importantly, demonstrate to the patient the impact of movement alteration on their symptoms. Movement pattern correction and motor relearning are increasingly reported as essential inclusions of effective rehabilitation strategies in rotator cuff pathology. In addition, demonstrating an immediate positive change in symptoms to patients is an extremely powerful tool in terms of motivation and compliance with subsequent treatment.

### Resistance/functional muscle tests

Resisted muscle tests are a standard inclusion in physical examination and are utilized to identify functional impairment. The use of such tests were found to feature strongly in the clinical reasoning of expert therapists.<sup>12</sup>

Static muscle holds can be applied to load the shoulder in different positions related to functional demands. (Table 2). It is important to differentiate whether any limitation is a result of pain inhibition or true weakness.

True weakness may indicate a full thickness tear,<sup>43</sup> disuse or more unusual reasons, such as a lack of nerve conduction (e.g. ganglion in the suprascapular notch).



**Figure 3.** Scapula assistance test.



**Figure 4.** Applying resistance to arm descent.

**Table 2.** Static muscle testing in different positions.

External rotation with arm by side
Internal rotation with arm by side
Flexion
Extension
Abduction or scaption in 90°
Subscapularis tests <sup>44,45</sup> ('lift off'/'belly press')
External rotation in 90°/90°
Internal rotation in 90°/90°

Where possible, applying resistance with the arm away from the body is recommended because this reflects the position in which most patients have pain and problems. In higher-functioning patients, muscle performance, particularly eccentric control, can be tested using weights or resistance banding through the range of movement.

### Scapulothoracic muscles

Impairment of the scapula muscles is commonly purported as a feature of rotator cuff pathology. Simple testing strategies can be used to assess muscle function.

Serratus anterior activity will be increased in protracted movements/positions; for example, in supine lying or pushing against a wall.<sup>46</sup> Testing in prone kneeling can be carried out for easy comparison with the contralateral side (Fig. 5).

Trapezius tests are commonly described when lying prone, assessing function with the arm in different ranges and leverages (Fig. 6a–d). A progressive testing procedure can be used not only to 'test' muscle control and strength, but also to help gauge suitable home exercises for treatment. As an example of lower trapezius activity,<sup>36</sup> can the scapula be raised against gravity and held (Fig. 6a,b)? The progression is to test the ability of the scapula position to be maintained when the small range arm extension is occurring (Fig. 6c,d). Because most shoulder problems occur in range and this is where scapula control is required, the tests then position the arm overhead with a short lever (elbow bent) (Fig. 6e) and, finally, with a straight arm (Fig. 6f).<sup>36,46</sup> These positions can be resisted with known weights to give feedback for muscle training.

These tests help not only to determine functional compromise but also to identify which exercises are

relevant for treatment inclusion: generally those that are weak and/or lack endurance rather than painful.<sup>8,47</sup> Although pain with exercise has been found to be a barrier for treatment adherence,<sup>48</sup> there is an increasing trend to promote the need for 'overload' and some pain in the rehabilitation of subacromial pain.<sup>26,27</sup>

### The scapula repositioning test (SRT)

The SRT is used to assess the effect of scapula position and stability during painful or weak resisted flexion (ie. 'empty can' position)<sup>49,50</sup> (Fig. 7). The scapula is manually positioned and held against the thorax with the hand and forearm, at the same time as giving resistance to arm flexion. If there is an improvement in strength testing or pain reduction, the test is positive. This will direct treatment to emphasize the scapula musculature, prior to loading the arm distally with the arm away from the body.

### The medial rotation test (MRT)<sup>51</sup>

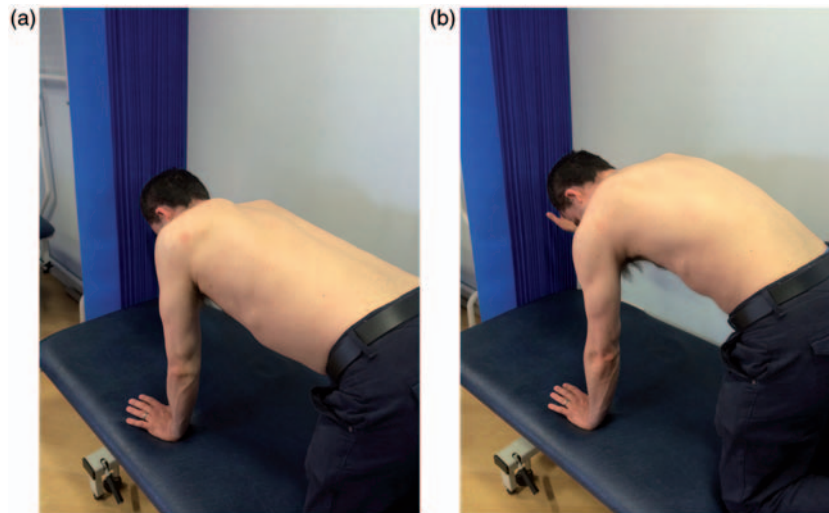
The MRT examines the relative stability of the scapula (with palpation on the coracoid), when 60° of active internal rotation is performed in abduction when lying supine. Assuming the range of movement is available, this test will give an indication of the patient's ability to actively control the scapula, when moving the humerus. This is another tool for measuring muscle control of the scapula with concurrent arm movement. If the range of internal rotation at the glenohumeral joint is limited as a result of capsular restriction or other mechanisms, the scapula movement may compensate.

### Passive range of movement

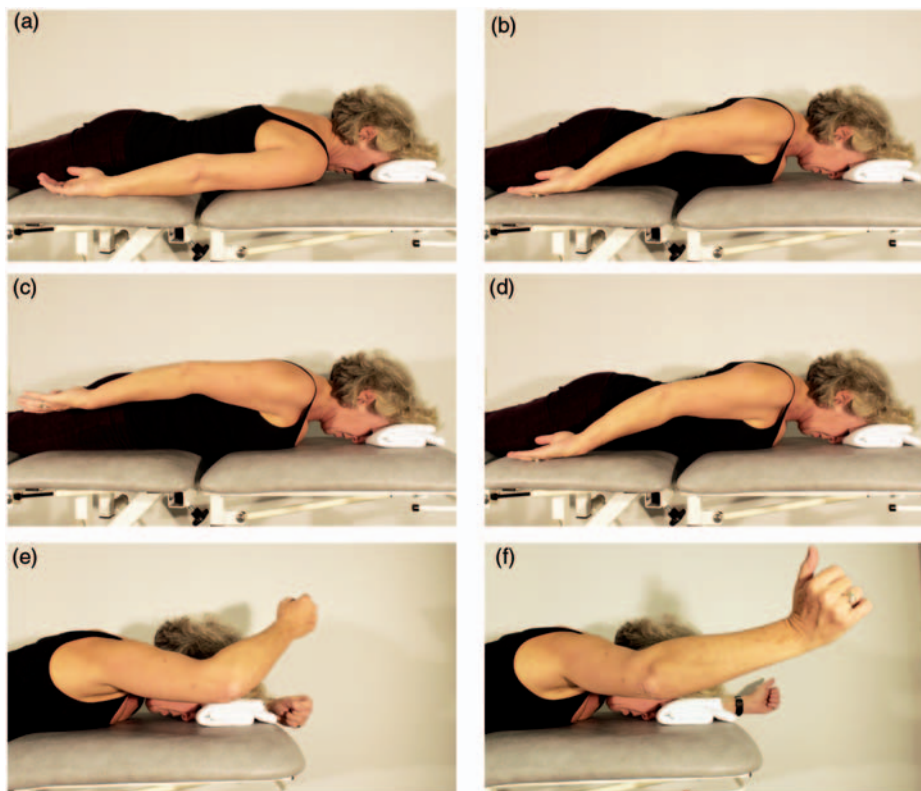
Lack of passive range of movement or capsular restriction is not the predominant feature of rotator cuff pathology. However, assessment of glenohumeral flexion, abduction and rotations, both neutral and through the range, is advised. Subacromial pain can be an early presentation of a developing frozen shoulder and therefore knowledge of external rotation range on assessment will provide a baseline measure. Although limitations of internal rotation in flexion and/or horizontal adduction are regarded as clinical indications of posterior shoulder/capsule tightness,<sup>52</sup> increasingly, the evidence suggests that this represents muscle stiffness rather than frank capsular restriction.<sup>53,54</sup>

### The kinetic chain

Assessment of the kinetic chain and its impact on the upper quadrant may be indicated in younger, high



**Figure 5.** Prone kneeling – serratus anterior bias test. (a) Poor scapula positioning seen on weight bearing arm. (b) corrected posture.



**Figure 6.** Prone lying trapezius bias test. (a) Starting position. (b) Scapula raise. (c) Scapula raise with concurrent arm extension. (d) Scapula raise with concurrent arm lower, elbow straight, hand to bed [i.e. (b) again]. (e) Arm raise from the scapula short lever, maintaining relative external rotation at the humerus (and lower). (f) Arm raise from the scapula long lever; approximately  $125^{\circ}$ , maintaining relative external rotation at the humerus.





**Figure 7.** Scapula retraction/repositioning test.

functional demand/sports patients and those with hypermobility and or/with poor muscle control.<sup>29,55</sup> However, patient understanding and ‘proof’ of involvement in a patient’s shoulder problem is necessary when the exercise programme is focused a long way from the painful shoulder!

### Putting it all together

Having completed a thorough assessment considering these different components, the physiotherapist needs to ‘put it all together’ for the individual patient. The clinical reasoning process aims to find and ‘prove’, if possible, the likely clinical diagnosis and the relevant findings from the examination in relation to the patient’s presenting problem. The clinician should summarize, explain and answer questions regarding their findings because this is the key to helping the patient understand why they could be getting pain and, crucially, how they may be able to change it.

During this discussion, it is helpful to show on a skeleton, the relationship of the shoulder with the scapula, thorax and neck and how the whole weight of the upper limb is suspended from the scapulothoracic musculature and clavicle. In addition, an explanation of the role of the cuff and scapulothoracic joint in overhead and long-limb activities can be helpful. The need for control/strength in

dynamic arm postures may also need to be discussed in the light of the patient’s muscle control (i.e. have they got the muscle control/strength for what they are trying to do or is the shoulder complex being over-challenged?)

If pain is the predominant symptom and no position or exercise can be found that is either pain-relieving or pain ‘neutral’, then possible corticosteroid injection or medication, including neural desensitizers, may be necessary to enable physiotherapy treatment. Treatment options, the setting of a realistic goal with the patient and then the practicalities of facilitating compliance need to be undertaken. Exercises (usually a maximum of four) are taught, written down or videoed on the patient’s mobile phone based on the salient examination findings. Establishing realistic time scales for expected change to occur (6 weeks to 12 weeks)<sup>8,9</sup> and arranging review appointments for feedback and progression have all been shown to aid compliance.<sup>56</sup>

### Conclusions

Physiotherapy is the primary low-risk treatment for individuals with shoulder pain without trauma and in older patients with minimal passive restriction but painful and/or restricted active movement. Physiotherapists are well placed to provide comprehensive assessment and care for this group of patients. Realistic time scales for assessment and response to treatment to occur are necessary, together with liaison with medical and surgical colleagues if other treatments are indicated.

### Declaration of conflicting interests

None declared.

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